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EXAMINER	
PRENDERGAST, ROBERTA D	

ART UNIT	PAPER NUMBER
2628	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/780,500	OH, BYONG MOK	
	Examiner	Art Unit	
	ROBERTA PRENDERGAST	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 December 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-11,13-28 and 32-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-11,13-28 and 32-41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 5-6, 8-10, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. U.S. Patent No. 6157747 in view of Luken U.S. Patent No. 5923334 and Seago U.S. Patent No. 5990900.

Referring to claim 1, Szeliski et al. teaches a computerized method for creating a three dimensional model from image panoramas, the method comprising:

receiving at a computer a plurality of image panoramas representing a visual scene and having an object (Figs. 1, 3 and 36A-38; column 27, Lines 34-48, i.e. constructing a complete panoramic mosaic, converting the set of input images and associated transforms into one or more images which can be quickly rendered or viewed by choosing either a cylindrical or spherical map and converting a rotational panorama to a spherical panorama indicates that a plurality of panoramas are being received. Figure 6, element 610 and column 11, lines 16-22 discloses wherein a deformation D provides a final correction such that the placement of a fixed object relative to the second image's re-warped coordinate system (x", y") is about the same as the object's placement relative to the first image's coordinate system (x, y) thus indicating that the plurality of image panoramas have an object as claimed),

the object occupying a field of view of more than 180 degrees in the panoramas and having an object (Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64, i.e. one of ordinary skill in the art at the time of invention would recognize that the wall objects in figures 33A and 33B and the hotel lobby wall objects are both shown occupying a field of view of more than 180 degrees since Applicant discloses that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph);

using the computer, determining a directional vector indicating an orientation of the visual scene with respect to a reference coordinate system (Fig. 15; column 22, lines 4-31, i.e. figure 15 shows the adjustment of the bundle of rays x_{jk} so that they converge to x_j. Letting the ray direction in the final composited image mosaic be a unit vector p, and its corresponding ray direction in the kth frame be p_{jk}~$R_k^{-1}V_k^{-1}x_{jk}$, indicates a directional vector for each image panorama as claimed);

transforming the image panoramas such that the directional vectors are substantially aligned relative to the reference coordinate system (Fig. 15; column 22, lines 2-31, i.e. figure 15 shows the adjustment of the bundle of rays x_{jk} so that they converge to x_j. Letting the ray direction in the final composited image mosaic be a unit vector p, and its corresponding ray direction in the kth frame be p_{jk}~$R_k^{-1}V_k^{-1}x_{jk}$, indicates transforming the image panoramas as claimed);

aligning the transformed image panoramas to each other (Figs. 17-18 and 20; column 22, lines 46-67; column 23, lines 10-12; column 24, lines 30-61, i.e. global alignment of the image panoramas is being performed using patch-based alignment).

Szeliski et al. does not specifically teach determining a directional vector for each image panorama; and

using the computer, creating a three dimensional model of the visual scene from the transformed and aligned image panoramas using the reference coordinate system, wherein creating a three dimensional model includes identifying at least one boundary of the object and using the identified boundary to associate geometry information with the object, the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in the reference coordinate system.

Luken teaches eight direction vectors D0-D7 associated with six rectangular images mapped to the inside of an octahedron wherein it is determined which of the six rectangular images is intersected by one of the eight direction vectors (Figs. 7-10, 14 and 17; Column 7, lines 28-36).

Seago et al. teaches creating a three dimensional model of the visual scene from the transformed and aligned image panoramas using the reference coordinate system (Fig. 2; column 4, lines 46-49, i.e. Figure 2 illustrates the process by which the image converting system 20 generates a three-dimensional model or object from a single two-dimensional image and an object contained within the digital image is selected for conversion into a three-dimensional object, and the selected object's orientation, or natural coordinate system, is approximately determined, wherein the reference coordinate system is the natural coordinate system.),

wherein creating a three dimensional model includes identifying at least one boundary of the object and using the identified boundary to associate geometry

information with the object (Fig. 2; columns 4-5, lines 65-1; column 5, lines 35-38, i.e. line creation can be performed automatically by image analysis software, which determines edges of objects and creates lines overlapping the determined edges, shapes or polygons that define the selected object's sides, and plane indexes are determined based on user-designated vertices or vanishing lines at significant features of the selected object),

the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in the reference coordinate system (Fig. 2 (element 54); column 5, lines 50-55, i.e. once all of the polygons and plane indexes of a selected object have been determined, a three-dimensional object, oriented within the selected object's three-dimensional coordinate space is determined).

Therefore it would have been obvious to one of ordinary skill in the art to modify the method of Szeliski et al. to include the teachings of Luken and Seago et al. wherein directional vectors for each image are used within an environment map that is mapped to the sides of an octahedron, as taught by Luken, with the three-dimensional model environment map of the visual scene, as taught by Szeliski, because Luken is directed to the same problem of using polyhedral environment maps to create and view three dimensional images from data representing multiple views of a scene, is in the same field of endeavor of image processing systems and expressly suggests that the direction vectors provide an efficient system for generating and viewing three-dimensional panoramic images based environment maps, and offer an improved level of interactive graphical feedback (Luken: column 3, lines 5-8), and wherein the three-dimensional

object editing abilities of Seago are used to modify the three-dimensional environment map of Szeliski because Seago expressly suggests that this method of object extraction produces accurate three-dimensional objects more efficiently than conventional systems that try to extract the three-dimensional objects using analytical mathematical interpretations and orthogonal image analysis (Seago: column 11, lines 49-55).

Referring to claim 2, the rationale for claim 1 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 1 wherein the directional vector is determined based, at least in part, on instructions identifying elements of the image panoramas received from a user (column 8, lines 30-32; column 27, lines 64-66, i.e. a user may enter commands and information into the computer through input devices and the shape of the model and the embedding of each face into texture space is left up to the user).

Referring to claim 3, the rationale for claim 2 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 2 wherein the instructions from the user identify two or more substantially parallel features in the image panoramas (column 8, lines 30-32; columns 20-21, lines 64-6; column 21, lines 25-34, i.e. a user may enter commands and information into the computer through input devices and the global alignment method is a feature-based method that relies on first establishing point correspondences between overlapping images).

Referring to claim 5, the rationale for claim 2 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 2 wherein the instructions from the user identify a horizon line of at least one image panorama (Figs. 3-4; column 9, lines

54-62, i.e. a camera 310 having its optical center fixed at point C (Fig. 3) captures a sequence of images I_0, I_1, I_2, I_3,... as it pans, the center rays of these images being focused on 3D points P_0, P_1, P_2, P_3,... at a focal length f from the optical center point C. The points P_i are defined relative to a fixed 3D world coordinate system P_x, P_y, P_z indicated in the drawings).

Referring to claim 6, the rationale for claim 2 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 2 wherein the instructions comprise the identification of two or more areas of the image panoramas, each area containing one or more elements and further comprising automatically identifying the two elements contained in the two or more areas (Fig. 6; columns 20-21, lines 49-24, i.e. a feature-based point correspondence is established between a pair of images by dividing each image into patches and identifying prospective "feature" points within the patches.).

Referring to claim 8, the rationale for claim 1 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 1 but does not specifically teach wherein the image panoramas are aligned relative to the reference coordinate system such that the directional vector of each panorama is at least substantially parallel to one axis of the reference coordinate system.

Luken teaches wherein the image panoramas are aligned relative to the reference coordinate system such that the directional vector of each panorama is at least substantially parallel to one axis of the reference coordinate system (Fig. 7 (element 707); columns 6-7, lines 40-36, i.e. since the six rectangular images are axis aligned, then a directional vector that is parallel to one axis must be perpendicular to the

other two spatial axes. In other words, in order for a directional vector to intersect one of the rectangular images, that vector must be substantially parallel to one axis, which requires it to be substantially perpendicular to the others).

The rationale for combining Szeliski et al., as modified above, with the teachings of Luken and Seago et al. as found in the motivation statement of claim 1 is incorporated herein.

Referring to claim 9, the rationale for claim 1 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 1 but does not specifically teach wherein the image panoramas are aligned relative to the reference coordinate system such that the directional vector of each panorama is at least substantially orthogonal to one axis of the reference coordinate system.

Luken teaches wherein the image panoramas are aligned relative to the reference coordinate system such that the directional vector of each panorama is at least substantially orthogonal to one axis of the reference coordinate system (Fig. 6A and 7 (element 707); columns 6-7, lines 40-36, i.e. since the six rectangular images are axis aligned, then a directional vector that is parallel to one axis must be perpendicular to the other two spatial axes. In other words, in order for a directional vector to intersect one of the rectangular images, that vector must be substantially parallel to one axis, which requires it to be substantially perpendicular to the others).

The rationale for combining Szeliski et al., as modified above, with the teachings of Luken and Seago et al. as found in the motivation statement of claim 1 is incorporated herein.

Referring to claim 10, the rationale for claim 1 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 1 wherein the image panoramas are aligned according to instructions received from a user (column 27, lines 64-66, i.e. the user aligns the image panoramas into texture space.).

Referring to claim 39, the rationale for claim 1 is incorporated herein, Szeliski et al., as modified above, teaches the method according to claim 1, wherein the object is a room and the at least one boundary of the object is the intersection of a wall of the room with the floor (column 27, lines 64-67, i.e. the model can be a cube with six separate texture maps for each surface. Using an appropriate environment map would cause the top surface to be a ceiling, the bottom surface to be a floor, etc.).

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. in view of Luken and Seago et al., as applied to claim 6 above, and further in view of Blank U.S. Patent No. 5469536.

Referring to claim 7, the rationale for claim 6 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 6 but does not specifically teach using edge detection to automatically identify the two elements.

Blank teaches detecting the edges of an object and separates portions of the image that are outside the edge of the object (i.e., the background component) from portions of the image that are inside the edge such that the two elements are therefore identified as those elements within the edge, and those outside the edge (column 4, lines 17-21).

Therefore it would have been obvious to one of ordinary skill in the art to modify the method of Szeliski et al. to include the teachings of Luken, Seago et al. and Bank wherein the edge detection methods, as taught by Blank, are used as an alternative to patch-based division, as taught by Szeliski, and as modified by Luken, because it is an effective way to divide the image into smaller portions to conquer aligning all aspects of an image.

Claims 11, 13-21, 23, and 36-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. in view of Seago et al. and Blank.

Referring to claim 11, Szeliski et al. teaches a computerized method of interactively editing objects in a panoramic image, the method comprising:

receiving an image panorama representing a.visual scene, the image panorama having an object and a point source (Figs. 1, 3 and 36A-38; column 27, Lines 34-48, i.e. constructing a complete panoramic mosaic, converting the set of input images and associated transforms into one or more images which can be quickly rendered or viewed by choosing either a cylindrical or spherical map and converting a rotational panorama to a spherical panorama indicates that a plurality of panoramas are being received. Figure 6, element 610 and column 11, lines 16-22 discloses wherein a deformation D provides a final correction such that the placement of a fixed object relative to the second image's re-warped coordinate system (x", y") is about the same as the object's placement relative to the first image's coordinate system (x, y) thus indicating that the plurality of image panoramas have an object as claimed),

the object occupying a field of view of more than 180 degrees in the panorama (Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64, i.e. one of ordinary skill in the art at the time of invention would recognize that the wall objects in figures 33A and 33B and the hotel lobby wall objects are both shown occupying a field of view of more than 180 degrees since Applicant discloses that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph).

Szeliski et al. does not specifically teach using the computer creating a three dimensional model of the visual scene using features of the visual scene and the point source, wherein creating a three dimensional model includes identifying at least one boundary, of the object and using the identified boundary to associate geometry information with the object, the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in a reference coordinate system;

using the computer receiving an edit to the object in the panorama;

using the computer transforming the edit relative to a viewpoint defined by the point source; and

projecting the transformed edit onto the object.

Seago et al. teaches creating a three dimensional model of the visual scene using features of the visual scene and the point source (Fig. 2; column 4, lines 46-49, i.e. Figure 2 illustrates the process by which the image converting system 20 generates a three-dimensional model or object from a single two-dimensional image and an object

contained within the digital image is selected for conversion into a three-dimensional object, and the selected object's orientation, or natural coordinate system, is approximately determined, wherein the reference coordinate system is the natural coordinate system.),

wherein creating a three dimensional model includes identifying at least one boundary, of the object and using the identified boundary to associate geometry information with the object (Fig. 2; columns 4-5, lines 65-1; column 5, lines 35-38, i.e. line creation can be performed automatically by image analysis software, which determines edges of objects and creates lines overlapping the determined edges, shapes or polygons that define the selected object’s sides, and plane indexes are determined based on user-designated vertices or vanishing lines at significant features of the selected object),

the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in a reference coordinate system (Fig. 2 (element 54); column 5, lines 50-55, i.e. once all of the polygons and plane indexes of a selected object have been determined, a three-dimensional object, oriented within the selected object’s three-dimensional coordinate space is determined).

Blank teaches using the computer receiving an edit to the object in the panorama (Abstract; column 30, lines 18-51; column 47, lines 1-64; column 48, lines 26-59, i.e. an object is selected for editing and the computer receives edits to trim, sharpen, blur blend, size, rotate and distort objects from the user);

using the computer transforming the edit relative to a viewpoint defined by the point source (Abstract; column 30, lines 18-51; column 47, lines 1-64; column 48, lines 26-59, i.e. an object is selected for editing and the computer receives edits to trim, sharpen, blur, blend, size, rotate and distort objects from the user thus indicating that the object is being transformed relative to a viewpoint); and

projecting the transformed edit onto the object (column 30, lines 33-51, i.e. after the user is satisfied with how an object is manipulated a copy of the object is pasted onto the background where it then becomes a part of the background image, since object edits are performed on the current object displayed in a white box, with other objects visible on the screen not being transformed, then the object transform edits are being projected onto the current object).

Therefore it would have been obvious to one of ordinary skill in the art to modify the method of Szeliski et al. to include the teachings of Seago et al. and Blank wherein the three-dimensional object editing abilities of Seago are used to modify the three-dimensional environment map of Szeliski because this method of object extraction produces accurate three-dimensional objects more efficiently than conventional systems that try to extract the three-dimensional objects using analytical mathematical interpretations and orthogonal image analysis (Seago et al.: column 11, lines 49-55) and to further include wherein an object is selected for editing and the computer receives edits to trim, sharpen, blur, blend, size, rotate and distort objects from the user thus indicating that the object is being transformed relative to a viewpoint such that object edits are performed on the current object displayed in a white box, with other

objects visible on the screen not being transformed thereby enabling the user to quickly and efficiently modify or enhance the appearance of an image to a desired goal (Blank: column 6, lines 23-28)

Referring to claim 13, the rationale for claim 11 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 11 but does not specifically teach receiving an edit to color information associated with the object.

Blank teaches receiving an edit to color information associated with the object (column 47, lines 21-56, i.e. sharpen, blur, fill, tint, blend, gray-scale and adjust color are all commands to edit a color thus indicating that these edits are being received).

The rationale for combining Szeliski et al., as modified above, with the teachings of Seago et al. and Blank as found in the motivation statement of claim 11 is incorporated herein.

Referring to claim 14, the rationale for claim 11 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 11 but does not specifically teach receiving an edit to alpha information associated with the object.

Blank teaches this limitation (Fig. 19B; column 47, lines 57-60, i.e. Adjust Transparency is a command for adjusting the alpha information of an object).

The rationale for combining Szeliski et al., as modified above, with the teachings of Seago et al. and Blank as found in the motivation statement of claim 11 is incorporated herein.

Referring to claim 15, the rationale for claim 11 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 11 but does not specifically teach receiving an edit to depth information associated with the object.

Blank teaches this limitation (Fig. 19c (element 274); column 2, lines 49-60; column 3, lines 55-67; column 5, lines 15-25; column 12, lines 44-62; column 13, lines 8-15, i.e. the computer blends the object into the selected background at the desired layer and X-Y position, wherein objects are moved to the desired depth/layer).

The rationale for combining Szeliski et al., as modified above, with the teachings of Seago et al. and Blank as found in the motivation statement of claim 11 is incorporated herein.

Referring to claim 16, the rationale for claim 11 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 11 but does not specifically teach receiving an edit to geometry information associated with the object.

Blank teaches this limitation (column 47, lines 11-20; column 48, lines 26-39 and 50-59, i.e. the Trim, Size, and Distort commands make changes to the geometry of the object).

The rationale for combining Szeliski et al., as modified above, with the teachings of Seago et al. and Blank as found in the motivation statement of claim 11 is incorporated herein.

Referring to claim 17, the rationale for claim 11 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 11 but does not specifically teach

providing a user with an interactive drawing tool that specifies edits for the object; and receiving the edits made by the user using the interactive drawing tool.

Blank teaches this limitation (column 21, lines 18-23, i.e. the system acts like a highly interactive and very powerful image editing tool).

The rationale for combining Szeliski et al., as modified above, with the teachings of Seago et al. and Blank as found in the motivation statement of claim 11 is incorporated herein.

Referring to claim 18, the rationale for claim 17 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 17 wherein the interactive drawing tool is one of an extrusion tool, a ground plane tool, a depth chisel tool and a non-uniform rational B-spline tool.

Blank teaches this limitation (column 12, lines 44-62; column 13, lines 8-15; column 47, lines 11-20, i.e. the interactive tool is a depth chisel tool).

The rationale for combining Szeliski et al., as modified above, with the teachings of Seago et al. and Blank as found in the motivation statement of claim 11 is incorporated herein.

Referring to claim 19, the rationale for claim 17 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 17 but does not specifically teach wherein the interactive drawing tool specifies a selected value for depth for the object.

Blank teaches this limitation (column 12, lines 44-62; column 13, lines 8-15, i.e. the user selects the desired layer/depth of a selected object).

The rationale for combining Szeliski et al., as modified above, with the teachings of Seago et al. and Blank as found in the motivation statement of claim 11 is incorporated herein.

Referring to claim 20, the rationale for claim 17 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 17 but does not specifically teach wherein the interactive drawing tool incrementally adds to the depth for the object.

Blank teaches this limitation (column 12, lines 44-62; column 13, lines 8-15, i.e. objects can be chosen to have a higher priority and hence a higher numbered layer and Z coordinate such that their priority may be incremented to add to their depth).

The rationale for combining Szeliski et al., as modified above, with the teachings of Seago et al. and Blank as found in the motivation statement of claim 11 is incorporated herein.

Referring to claim 21, the rationale for claim 17 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 17 but does not specifically teach wherein the interactive drawing tool incrementally subtracts from the depth for the object.

Blank teaches this limitation (column 12, lines 44-62; column 13, lines 8-15, i.e. objects can be chosen to have a lower priority and hence a lower numbered layer and Z coordinate such that their priority may be decremented to subtract from their depth).

The rationale for combining Szeliski et al., as modified above, with the teachings of Seago et al. and Blank as found in the motivation statement of claim 11 is incorporated herein.

The rationale of claim 17 is applied to claim 23.

Referring to claim 36, claim 36 recites elements that are similar in scope to claims 11 and 17, and therefore the rationale for the rejection of claims 11 and 17 are incorporated herein.

Referring to claim 37, claim 37 recites all of the elements of claims 18 and 36, and therefore the rationale for the rejection of claims 18 and 36 are incorporated herein.

Claims 22, 24-28, 32-35, 38 and 40-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. in view of Seago et al.

Referring to claim 22, Szeliski et al. teaches a computerized method for projecting texture information onto an object within an image panorama, the method comprising:

using the computer receiving instructions from a user identifying a three-dimensional geometric surface within an image panorama, the image panorama containing an object having one or more textures (Figs. 1, 3 and 36A-38; column 27, lines 34-41; columns 27-28, lines 60-12, i.e. the shape of the model and the embedding of each face are left up to the user such that the user can choose something as simple as a cube with six separate texture maps or a spherical texture map. Figure 6, element 610 and column 11, lines 16-22 discloses wherein a deformation D provides a final correction such that the placement of a fixed object relative to the second image's re-warped coordinate system (x", y") is about the same as the object's placement relative

to the first image's coordinate system (x, y) thus indicating that the plurality of image panoramas have an object as claimed),

the object occupying a field of view of more than 180 degrees in the panorama (Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64, i.e. one of ordinary skill in the art at the time of invention would recognize that the wall objects in figures 33A and 33B and the hotel lobby wall objects are both shown occupying a field of view of more than 180 degrees since Applicant discloses that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph);

determining a directional vector from the three-dimensional geometric surface (Fig. 15; column 22, lines 4-31, i.e. figure 15 shows the adjustment of the bundle of rays x_{jk} so that they converge to x_j. Letting the ray direction in the final composited image mosaic be a unit vector p, and its corresponding ray direction in the kth frame be $p_{jk} \sim R_k^{-1} V_k^{-1} x_{jk}$, indicates a directional vector from the surface as claimed);

using the computer creating a geometric model of the image panorama based at least in part on the three-dimensional geometric surface and the directional vector (Figs. 17-18 and 20; column 7, lines 29-33; column 22, lines 2-31 and 46-67; column 23, lines 10-12; column 24, lines 30-61, i.e. the direction vectors are used to align the images of the panoramic image such that global alignment of the image panoramas is being performed using patch-based alignment); and

applying the one or more textures to the object in the image panorama based on the geometric model (Fig. 2B; column 28, lines 13-15, i.e. efficiently computing texture map color values for any geometry and choice of texture map coordinates).

Szeliski et al. does not specifically teach wherein creating a geometric model includes identifying at least one boundary of the object and using the identified boundary to associate geometry information with the object, the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in a reference coordinate system.

Seago et al. teaches creating a three dimensional model of the visual scene (Fig. 2; column 4, lines 46-49, i.e. Figure 2 illustrates the process by which the image converting system 20 generates a three-dimensional model or object from a single two-dimensional image and an object contained within the digital image is selected for conversion into a three-dimensional object, and the selected object's orientation, or natural coordinate system, is approximately determined, wherein the reference coordinate system is the natural coordinate system.),

wherein creating a three dimensional model includes identifying at least one boundary of the object and using the identified boundary to associate geometry information with the object (Fig. 2; columns 4-5, lines 65-1; column 5, lines 35-38, i.e. line creation can be performed automatically by image analysis software, which determines edges of objects and creates lines overlapping the determined edges, shapes or polygons that define the selected object's sides, and plane indexes are

determined based on user-designated vertices or vanishing lines at significant features of the selected object),

the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in the reference coordinate system (Fig. 2 (element 54); column 5, lines 50-55, i.e. once all of the polygons and plane indexes of a selected object have been determined, a three-dimensional object, oriented within the selected object's three-dimensional coordinate space is determined).

Therefore it would have been obvious to one of ordinary skill in the art to modify the method of Szeliski et al. to include the teachings of Seago et al. wherein the three-dimensional object editing abilities of Seago are used to modify the three-dimensional environment map of Szeliski because Seago expressly suggests that this method of object extraction produces accurate three-dimensional objects more efficiently than conventional systems that try to extract the three-dimensional objects using analytical mathematical interpretations and orthogonal image analysis (Seago: column 11, lines 49-55).

Referring to claim 24, the rationale for claim 22 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 22 wherein the three-dimensional geometric surface is one of a floor, a wall, or a ceiling (column 27, lines 60-67, i.e. the shape of the model and the embedding of each face into texture space can be a simple cube with six separate texture maps for each surface. Using an appropriate environment map would result in the top surface being a ceiling, the bottom surface being a floor and the side surfaces being a wall, see figures33A-33D).

Referring to claim 25, the rationale for claim 22 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 22 wherein the directional vector is orthogonal to the planar surface (Fig. 15, column 22, lines 4-6, i.e. the ray direction going through the j^{th} feature point located at x_{jk}, y_{jk} in the k^{th} frame indicates that the directional vector is orthogonal as claimed).

Referring to claim 26, the rationale for claim 22 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 22 wherein the geometric model comprises depth information (Figs. 27 and 30; column 28, lines 19-33, i.e. the object model is a triangulated surface where each vertex is tagged with its 3D (X,, Y, Z) coordinates).

Referring to claim 27, the rationale for claim 22 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 22 wherein the texture information comprises color information (column 28, lines 13-18, i.e. texture map color values are computed for any geometry and choice of texture map coordinates).

Referring to claim 28, the rationale for claim 22 is incorporated herein, Szeliski et al., as modified above, teaches the method of claim 22 wherein the texture information comprises luminance information (Fig. 2B; column 5, lines 27-30; column 11, lines 57; column 29, lines 30-40 and 60-65, i.e. one of ordinary skill in the art at the time of invention would recognize that intensity is equivalent to luminance).

Referring to claim 32, Szeliski et al. teaches a system for creating a three dimensional model from a plurality of image panoramas, the system comprising:

means for receiving the image panoramas representing a visual scene having an object (Figs. 1, 3 and 36A-38; column 27, lines 34-41; columns 27-28, lines 60-12, i.e. the shape of the model and the embedding of each face are left up to the user such that the user can choose something as simple as a cube with six separate texture maps or a spherical texture map. Figure 6, element 610 and column 11, lines 16-22 discloses wherein a deformation D provides a final correction such that the placement of a fixed object relative to the second image's re-warped coordinate system (x", y") is about the same as the object's placement relative to the first image's coordinate system (x, y) thus indicating that the plurality of image panoramas have an object as claimed);

the object occupying a field of view of more than 180 degrees in the panoramas (Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64, i.e. one of ordinary skill in the art at the time of invention would recognize that the wall objects in figures 33A and 33B and the hotel lobby wall objects are both shown occupying a field of view of more than 180 degrees since Applicant discloses that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph),

means for allowing a user to interact with the system to determine a directional vector for each image panorama (Fig. 15; column 22, lines 4-31, i.e. figure 15 shows the adjustment of the bundle of rays x_{jk} so that they converge to x_j. Letting the ray direction in the final composited image mosaic be a unit vector p, and its corresponding ray direction in the kth frame be $p_{jk} \sim R_k^{-1} V_k^{-1} x_{jk}$, indicates a directional vector from the surface as claimed);

means for aligning the image panoramas relative to each other (Figs. 17-18 and 20; column 7, lines 29-33; column 22, lines 2-31 and 46-67; column 23, lines 10-12; column 24, lines 30-61, i.e. the direction vectors are used to align the images of the panoramic image such that global alignment of the image panoramas is being performed using patch-based alignment); and

means for creating a three dimensional model from the aligned (Figs. 17-18 and 20; column 7, lines 29-33; column 22, lines 2-31 and 46-67; column 23, lines 10-12; column 24, lines 30-61, i.e. the direction vectors are used to align the images of the panoramic image such that global alignment of the image panoramas is being performed using patch-based alignment).

Szeliski et al. does not specifically teach wherein creating a geometric model includes identifying at least one boundary of the object and using the identified boundary to associate geometry information with the object, the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in a reference coordinate system.

Seago et al. teaches creating a three dimensional model of the visual scene (Fig. 2; column 4, lines 46-49, i.e. Figure 2 illustrates the process by which the image converting system 20 generates a three-dimensional model or object from a single two-dimensional image and an object contained within the digital image is selected for conversion into a three-dimensional object, and the selected object's orientation, or natural coordinate system, is approximately determined, wherein the reference coordinate system is the natural coordinate system.),

wherein creating a three dimensional model includes identifying at least one boundary of the object and using the identified boundary to associate geometry information with the object (Fig. 2; columns 4-5, lines 65-1; column 5, lines 35-38, i.e. line creation can be performed automatically by image analysis software, which determines edges of objects and creates lines overlapping the determined edges, shapes or polygons that define the selected object's sides, and plane indexes are determined based on user-designated vertices or vanishing lines at significant features of the selected object),

the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in the reference coordinate system (Fig. 2 (element 54); column 5, lines 50-55, i.e. once all of the polygons and plane indexes of a selected object have been determined, a three-dimensional object, oriented within the selected object's three-dimensional coordinate space is determined).

Therefore it would have been obvious to one of ordinary skill in the art to modify the method of Szeliski et al. to include the teachings of Seago et al. wherein the three-dimensional object editing abilities of Seago are used to modify the three-dimensional environment map of Szeliski because Seago expressly suggests that this method of object extraction produces accurate three-dimensional objects more efficiently than conventional systems that try to extract the three-dimensional objects using analytical mathematical interpretations and orthogonal image analysis (Seago: column 11, lines 49-55).

Referring to claim 33, the rationale for claim 32 is incorporated herein, Szeliski et al., as modified above, teaches the system of claim 32, wherein the input image panoramas comprise two-dimensional images (Figs. 3-5; columns 9-10, lines 56-1, i.e. a camera captures 2D still images that are registered so that a panorama may be constructed).

Referring to claim 34, the rationale for claim 32 is incorporated herein, Szeliski et al., as modified above, teaches the system of claim 32, wherein the input image panoramas comprise three-dimensional images including geometry information (Figs. 3-4 and 6; column 9, lines 56-62, i.e. the camera captures a sequence of 2D still images (I_0, I_1, I_2, I_3.) as it pans, the center rays of these images being focused on 3D points (P_0, P_1, P_2, $P_{3...}$) at a focal length f from the optical center point C. The points P_i are defined relative to a fixed 3D world coordinate system (P_x, P_y, P_z). Since the three-dimensional images correspond to the two-dimensional images which include depth information in the form of focal length then the geometry information is the inverted V shape shown in both figures 4 and 6).

Referring to claim 35, the rationale for claim 32 is incorporated herein, Szeliski et al., as modified above, teaches the system of claim 32, wherein the image panoramas are aligned according to instructions received from a user (Figs. 2B, 17-18 and 20; column 22, lines 46-67; column 23, lines 10-12; column 24, lines 30-61; column 27, lines 64-66, i.e. the user aligns the image panoramas into texture space.).

Referring to claim 38, Szeliski et al. teaches a computerized method for creating a three dimensional model from an image panorama, the method comprising:

receiving an image panorama representing a visual scene and having an object (Figs. 1, 3 and 36A-38; column 27, Lines 34-48, i.e. constructing a complete panoramic mosaic, converting the set of input images and associated transforms into one or more images which can be quickly rendered or viewed by choosing either a cylindrical or spherical map and converting a rotational panorama to a spherical panorama indicates that a plurality of panoramas are being received. Figure 6, element 610 and column 11, lines 16-22 discloses wherein a deformation D provides a final correction such that the placement of a fixed object relative to the second image's re-warped coordinate system (x", y") is about the same as the object's placement relative to the first image's coordinate system (x, y) thus indicating receiving an image panorama having an object as claimed),

the object occupying a field of view of more than 180 degrees in the panorama (Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64, i.e. one of ordinary skill in the art at the time of invention would recognize that the wall objects in figures 33A and 33B and the hotel lobby wall objects are both shown occupying a field of view of more than 180 degrees since Applicant discloses that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph); and

creating a three dimensional model of the visual scene using a computer from the image panorama using the reference coordinate system (Figs. 17-18 and 20; column 7, lines 29-33; column 22, lines 2-31 and 46-67; column 23, lines 10-12; column 24, lines 30-61, i.e. the direction vectors are used to align the images of the panoramic

image such that global alignment of the image panoramas is being performed using patch-based alignment).

Szeliski et al. does not specifically teach wherein creating a geometric model includes identifying at least one boundary of the object and using the identified boundary to associate geometry information with the object, the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in a reference coordinate system.

Seago et al. teaches creating a three dimensional model of the visual scene (Fig. 2; column 4, lines 46-49, i.e. Figure 2 illustrates the process by which the image converting system 20 generates a three-dimensional model or object from a single two-dimensional image and an object contained within the digital image is selected for conversion into a three-dimensional object, and the selected object's orientation, or natural coordinate system, is approximately determined, wherein the reference coordinate system is the natural coordinate system.),

wherein creating a three dimensional model includes identifying at least one boundary of the object and using the identified boundary to associate geometry information with the object (Fig. 2; columns 4-5, lines 65-1; column 5, lines 35-38, i.e. line creation can be performed automatically by image analysis software, which determines edges of objects and creates lines overlapping the determined edges, shapes or polygons that define the selected object's sides, and plane indexes are determined based on user-designated vertices or vanishing lines at significant features of the selected object),

the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in the reference coordinate system (Fig. 2 (element 54); column 5, lines 50-55, i.e. once all of the polygons and plane indexes of a selected object have been determined, a three-dimensional object, oriented within the selected object's three-dimensional coordinate space is determined).

Therefore it would have been obvious to one of ordinary skill in the art to modify the method of Szeliski et al. to include the teachings of Seago et al. wherein the three-dimensional object editing abilities of Seago are used to modify the three-dimensional environment map of Szeliski because Seago expressly suggests that this method of object extraction produces accurate three-dimensional objects more efficiently than conventional systems that try to extract the three-dimensional objects using analytical mathematical interpretations and orthogonal image analysis (Seago: column 11, lines 49-55).

Referring to claim 40, the rationale for claim 22 is incorporated herein, Szeliski et al., as modified above, teaches the method according to claim 22, wherein the object is a room and the at least one boundary of the object is the intersection of a wall of the room with the floor (column 27, lines 64-67, i.e. the model can be a cube with six separate texture maps for each surface. Using an appropriate environment map would cause the top surface to be a ceiling, the bottom surface to be a floor, etc.).

Referring to claim 41, claim 41 recites all of the elements of claims 40 and 38 and therefore the rationale for the rejection of claims 40 and 38 are incorporated herein.

Response to Arguments

Applicant's arguments filed 12/21/2010 have been fully considered but they are not persuasive.

Applicant first argues, with respect to claims 22-28, 32-35, 38 and 40-41, that neither Szeliski nor Seago teaches creating a geometric model of an object within an image panorama including identifying at least one boundary of the object where the object occupies a field of view in the panorama of grater than 180 degrees as required by each of the claims.

Examiner respectfully submits that Szeliski et al. teaches receiving panoramic images containing an object occupying a field of view of more than 180 degrees, see Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64. One of ordinary skill in the art at the time of invention would recognize that the Szeliski reference teaches an object occupying such a field of view because the wall objects in figures 33A and 33B and the hotel lobby wall and floor objects are both shown occupying a field of view of more than 180 degrees since Applicant themselves disclosed that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph. Szeliski et al. further teaches the use of traditional texture-mapped models, i.e. environment maps, wherein the shape of the model may be chosen as a simple cube with six separate texture maps indicating an environment map whose sides occupy a field of view of more than 180 degrees, see column 27, lines 60-67. Szeliski et al. also teaches an object model that is a collection of triangles and vertices wherein each

vertex is tagged with its 3D (X, Y, and Z) coordinates and 2D (u, v) coordinates whose faces may be assigned to different texture maps. Thus Szeliski discloses the ability to generate a 3D model of an object in an image wherein the 3D model may occupy a field of view of more than 180 degrees. Szeliski does not specifically teach wherein creating the geometric model includes identifying at least one boundary of the object and using the identified boundary to associate geometry information with the object, the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in a reference coordinate system. Seago is depended upon to teach wherein creating a geometric model includes identifying at least one boundary of the object and using the identified boundary to associate geometry information with the object, the geometry information comprising 3-D coordinates describing the position and orientation of the object boundary in a reference coordinate system, see Fig. 2; column 4, lines 46-49, columns 4-5, lines 65-1; column 5, lines 35-38 and 50-55. One of ordinary skill in the art at the time of invention would be able to apply the method of Seago, which takes 2-D planar images, determines vanishing points to derive a 3D coordinate system, and models the objects within the images, to the teachings of Szeliski which also includes the use of 2D perspective images and 3D models of objects within the images in order to improve Szeliski because Seago's method of object extraction produces accurate three-dimensional objects more efficiently than conventional systems that try to extract the three-dimensional objects using analytical mathematical interpretations and orthogonal image analysis (Seago et al.: column 11, lines 49-55).

Applicant then argues, with respect to claim 22, that if the combination of Szeliski and Seago teaches limitation (b) of claim 22, Seago '900 must supply the teaching of modeling the object using an identified boundary of the object where the object occupies the field of view of more than 180 degrees in the panorama as required by limitation (a) of claim 22. However, Seago's method fails when the object to be modeled occupies a field of view greater than 180 degrees in the input image(s).

Examiner respectfully submits that Seago teaches wherein a sufficient set of features may include **any** set of matching or conjugate vertices, vanishing lines, or planes between the multiple images, see column 7, lines 35-41, and further goes on to disclose that the relative orientation of a view is how the vertices, vanishing lines, or planes it sees correspond to those other views. For example, **if two views of the same object differ by 180 degrees,** the left vanishing lines and planes in one view are the right vanishing lines and planes in the other view, see column 7, lines 42-49. One of ordinary skill in the art would recognize that this disclosure indicates that the method of Seago would indeed work for objects that cover a field of view greater than 180 degrees (as disclosed in Szeliski) and therefore the combination of primary reference Szeliski et al. with secondary reference Seago et al. teaches all of the elements of claims 22-28, 32-35, 38 and 40-41 as claimed. Szeliski et al. teaches receiving panoramic images containing an object occupying a field of view of more than 180 degrees, see Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64. One of ordinary skill in the art at the time of invention would recognize that the Szeliski reference teaches an object occupying such a field of view because the wall objects in figures 33A

and 33B and the hotel lobby wall and floor objects are both shown occupying a field of view of more than 180 degrees since Applicant themselves disclosed that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph. Szeliski et al. further teaches the use of traditional texture-mapped models, i.e. environment maps, wherein the shape of the model may be chosen as a simple cube with six separate texture maps indicating an environment map whose sides occupy a field of view of more than 180 degrees, see column 27, lines 60-67. Szeliski et al. also teaches an object model that is a collection of triangles and vertices wherein each vertex is tagged with its 3D (X, Y, and Z) coordinates and 2D (u, v) coordinates whose faces may be assigned to different texture maps. Thus Szeliski discloses the ability to generate a 3D model of an object in an image wherein the 3D model may occupy a field of view of more than 180 degrees.

Applicant then argues, with respect to claim 22, that the input to Seago's method is a 2-D perspective image or a group of 2-D perspective images displaying the object to be modeled. However, when the object to be modeled requires a field of view of more than 180 degrees, the entire object will not fit onto a single 2D perspective image and Seago's method requires that a separate 3D model be made of the object from each of the 2D perspective images. When each 2D image does not contain the entire object, Seago's method fails because the required 3D models of the object cannot be created.

Examiner respectfully submits that Seago teaches wherein a **single three-dimensional object** is created from two or more three-dimensional objects created from a plurality of two-dimensional images of a single object, see column 7, lines 29-65,

and also teaches wherein a **single three-dimensional object** is created from a single two-dimensional image, see column 4, lines 34-65, thus Seago's method does not fail as argued. Szeliski teaches generating a **single panoramic image** from a plurality of two-dimensional perspective images, see columns 9-10, lines 53-6 and column 31, lines 44-64. Thus, the combination of primary reference Szeliski with secondary reference Seago teaches all of the elements of claim 22.

Applicant then uses figures 1-6 to indicate that because the object requires a field of view of more than 180 degrees, the object will not fit on a single 2D perspective image and that the curved wall object in figure 1 wraps around the camera object but to create a mosaic similar to Szeliski the user must take multiple overlapping photos to span the wall's extent, which is greater than 180 degrees such that the mosaiced image to be used comprises three 2D images that have sufficient overlap to register the images. But that the final mosaic created with the three initial images cannot be displayed as a single 2D perspective image that preserves the features that are used to register or model the scene and objects within the scene.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the final mosaic created with the three initial images cannot be displayed as a single 2D perspective image that preserves the features that are used to register or model the scene and objects within the scene, see Remarks, page 19 of 23) are not recited in the rejected claim(s). Although the claims are interpreted in light of the

specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Examiner respectfully submits that Szeliski et al. teaches receiving panoramic images containing an object occupying a field of view of more than 180 degrees, see Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64. One of ordinary skill in the art at the time of invention would recognize that the Szeliski reference teaches an object occupying such a field of view because the wall objects in figures 33A and 33B and the hotel lobby wall and floor objects are both shown occupying a field of view of more than 180 degrees since Applicant themselves disclosed that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph. Szeliski et al. further teaches the use of traditional texture-mapped models, i.e. environment maps, wherein the shape of the model may be chosen as a simple cube with six separate texture maps indicating an environment map whose sides occupy a field of view of more than 180 degrees, see column 27, lines 60-67. Szeliski et al. also teaches an object model that is a collection of triangles and vertices wherein each vertex is tagged with its 3D (X, Y, and Z) coordinates and 2D (u, v) coordinates whose faces may be assigned to different texture maps. Thus Szeliski discloses the ability to generate a 3D model of an object in an image wherein the 3D model may occupy a field of view of more than 180 degrees. Seago teaches wherein a sufficient set of features may include **any** set of matching or conjugate vertices, vanishing lines, or planes between the multiple images, see column 7, lines 35-41, and further goes on to disclose

that the relative orientation of a view is how the vertices, vanishing lines, or planes it sees correspond to those other views. For example, **if two views of the same object differ by 180 degrees,** the left vanishing lines and planes in one view are the right vanishing lines and planes in the other view, see column 7, lines 42-49. One of ordinary skill in the art would recognize that this disclosure indicates that the method of Seago would indeed work for objects that cover a field of view greater than 180 degrees and therefore the combination of primary reference Szeliski et al. with secondary reference Seago et al. teaches all of the elements of claims 22-28, 32-35, 38 and 40-41 as claimed.

Applicant then argues that the warping needed to force objects with extents greater than 180 degrees onto a single 2D image destroys the perspective view of these objects and that such warping renders the single image useless for Seago's method, which demands perspective images of objects as input.

Examiner respectfully submits that one of ordinary skill in the art at the time of invention would be able to apply the method of Seago, which takes 2-D planar images, determines vanishing points to derive a 3D coordinate system, and models the objects within the images, to the teachings of Szeliski which also includes the use of 2D perspective images and 3D models of objects within the images in order to improve Szeliski because Seago's method of object extraction produces accurate three-dimensional objects more efficiently than conventional systems that try to extract the three-dimensional objects using analytical mathematical interpretations and orthogonal image analysis (Seago et al.: column 11, lines 49-55).

According to *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1739 (2007) at 1396, "if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." As established above, both Seago and Szeliski use 2D perspective images and one of ordinary skill would recognize how to create object models from the 2D perspective images of Szeliski using the method of Seago. Examiner notes that the perspective information required to perform the method of Seago is not eliminated in Szeliski, regardless of whether the objects in the images occupy a field of view greater than 180 degrees. Therefore, Examiner maintains her position that the combination of Szeliski and Seago would have been obvious and teaches limitations for which they are cited.

Applicant then argues, with respect to claims 22-28, 32-35, 38 and 40-41, that "Clearly, if any of the object's three orthogonal sides cannot be located in each image, steps 42 and 44 cannot be performed. Using the simplest example of a wall that does not fit on a single 2D image, consider the process of geometrically modeling the wall, which is taken as two overlapping images, A and B." and cites to figures 8-12 for support, stating that because no features are visible for portions of the wall object in the various images then the slope and position of the lines 3 and 4 cannot be determined unambiguously.

Examiner respectfully submits that Seago does not impose a 180 degree limit as argued, Seago teaches wherein a sufficient set of features may include **any** set of matching or conjugate vertices, vanishing lines, or planes between the multiple images,

see column 7, lines 35-41, and further goes on to disclose that the relative orientation of a view is how the vertices, vanishing lines, or planes it sees correspond to those other views. For example, **if two views of the same object differ by 180 degrees,** the left vanishing lines and planes in one view are the right vanishing lines and planes in the other view, see column 7, lines 42-49. One of ordinary skill in the art would recognize that this disclosure indicates that the method of Seago would indeed work for objects that cover a field of view greater than 180 degrees and therefore the combination of primary reference Szeliski et al. with secondary reference Seago et al. teaches all of the elements of claims 22-28, 32-35, 38 and 40-41 as claimed.

One of ordinary skill in the art at the time of invention would be able to apply the method of Seago, which takes 2-D planar images, determines vanishing points to derive a 3D coordinate system, and models the objects within the images, to the teachings of Szeliski which also includes the use of 2D perspective images and 3D models of objects within the images in order to improve Szeliski because Seago's method of object extraction produces accurate three-dimensional objects more efficiently than conventional systems that try to extract the three-dimensional objects using analytical mathematical interpretations and orthogonal image analysis (Seago et al.: column 11, lines 49-55).

According to *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1739 (2007) at 1396, "if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." As

established above, both Seago and Szeliski use 2D perspective images and one of ordinary skill would recognize how to create object models from the 2D perspective images of Szeliski using the method of Seago. Examiner notes that the perspective information required to perform the method of Seago is not eliminated in Szeliski, regardless of whether the objects in the images occupy a field of view greater than 180 degrees. Therefore, Examiner maintains her position that the combination of Szeliski and Seago would have been obvious and teaches limitations for which they are cited.

Applicant then argues, with respect to claims 22-28, 32-35, 38 and 40-41, that "Steps 42 and 44 in fig. 2 of Seago '900 cannot be performed accurately for image B for the rightmost orthogonal side of the wall object. Thus, Seago's method will fail to produce a 3D model of the wall from image B. Thus, Seago's method will fail because separate 3D models cannot be created from each of the multiple 2D perspective images needed to show an object with extent > 180 degrees."

Examiner respectfully submits that Seago teaches wherein a sufficient set of features may include **any** set of matching or conjugate vertices, vanishing lines, or planes between the multiple images, see column 7, lines 35-41, and further goes on to disclose that the relative orientation of a view is how the vertices, vanishing lines, or planes it sees correspond to those other views. For example, **if two views of the same object differ by 180 degrees,** the left vanishing lines and planes in one view are the right vanishing lines and planes in the other view, see column 7, lines 42-49. One of ordinary skill in the art would recognize that this disclosure indicates that the method of Seago would indeed work for objects that cover a field of view greater than 180 degrees

and therefore the combination of primary reference Szeliski et al. with secondary reference Seago et al. teaches all of the elements of claims 22-28, 32-35, 38 and 40-41 as claimed. Szeliski et al. teaches receiving panoramic images containing an object occupying a field of view of more than 180 degrees, see Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64. One of ordinary skill in the art at the time of invention would recognize that the Szeliski reference teaches an object occupying such a field of view because the wall objects in figures 33A and 33B and the hotel lobby wall and floor objects are both shown occupying a field of view of more than 180 degrees since Applicant themselves disclosed that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph. Szeliski et al. further teaches the use of traditional texture-mapped models, i.e. environment maps, wherein the shape of the model may be chosen as a simple cube with six separate texture maps indicating an environment map whose sides occupy a field of view of more than 180 degrees, see column 27, lines 60-67. Szeliski et al. also teaches an object model that is a collection of triangles and vertices wherein each vertex is tagged with its 3D (X, Y, and Z) coordinates and 2D (u, v) coordinates whose faces may be assigned to different texture maps. Thus Szeliski discloses the ability to generate a 3D model of an object in an image wherein the 3D model may occupy a field of view of more than 180 degrees.

Applicant then argues, with respect to claims 22-28, 32-35, 38 and 40-41, that "To be sure, Szeliski '774's method can be used to produce a single 2D image that has four vertices visible to model in the case of the wall shown in figs. 8-12, since the

wall's extent is not greater than 180 degrees. But for objects that require more than a 180 degree field of view, the necessary vertices (and edges/planes) cannot be projected onto a single 2D perspective image to satisfy Seago '900's method. (See figs. 1-7 and accompanying discussion above.) If a mosaic/panorama with an object extends beyond 180 degrees, the image needs to be warped/remapped to fit into a single 2D image. Warping or remapping features does not work for Seago's method because Seago's method relies on perspective, e.g., straight lines on objects are no longer straight, etc."

Examiner respectfully submits that Seago teaches wherein a sufficient set of features may include **any** set of matching or conjugate vertices, vanishing lines, or planes between the multiple images, see column 7, lines 35-41, and further goes on to disclose that the relative orientation of a view is how the vertices, vanishing lines, or planes it sees correspond to those other views. For example, **if two views of the same object differ by 180 degrees,** the left vanishing lines and planes in one view are the right vanishing lines and planes in the other view, see column 7, lines 42-49. One of ordinary skill in the art would recognize that this disclosure indicates that the method of Seago would indeed work for objects that cover a field of view greater than 180 degrees and therefore the combination of primary reference Szeliski et al. with secondary reference Seago et al. teaches all of the elements of claims 22-28, 32-35, 38 and 40-41 as claimed. Szeliski et al. teaches receiving panoramic images containing an object occupying a field of view of more than 180 degrees, see Figs. 1, 3, 6, 33A-B, and 36A-38; column 11, lines 16-21; column 31, lines 51-64. One of ordinary skill in the art at the time of invention would recognize that the Szeliski reference teaches an object

occupying such a field of view because the wall objects in figures 33A and 33B and the hotel lobby wall and floor objects are both shown occupying a field of view of more than 180 degrees since Applicant themselves disclosed that panoramic images of wall structures indicate objects occupying a field of view of more than 180 degrees, see Remarks, filed 2/28/2008, page 11, 2nd paragraph. Szeliski et al. further teaches the use of traditional texture-mapped models, i.e. environment maps, wherein the shape of the model may be chosen as a simple cube with six separate texture maps indicating an environment map whose sides occupy a field of view of more than 180 degrees, see column 27, lines 60-67. It is noted that the inputs to the image panorama of Szeliski et al. is a series of two-dimensional perspective view images that are registered to construct the panoramic mosaic, see columns 9-10, lines 510. Szeliski et al. also teaches an object model that is a collection of triangles and vertices wherein each vertex is tagged with its 3D (X, Y, and Z) coordinates and 2D (u, v) coordinates whose faces may be assigned to different texture maps. Thus Szeliski discloses the ability to generate a 3D model of an object in an image wherein the 3D model may occupy a field of view of more than 180 degrees.

Applicant then argues, with respect to claims 11, 13-21, 23 and 36-37 over Szeliski, Seago and Blank, claims 1-3, 5-6, 8-10, and 39 over Szeliski, Seago and Luken, and claim 7 over Szeliski, Seago, Luken and Blank, that the rejections of these claims rely on Szeliski and Seago for teaching the limitations cited above for claims 22 and 32 and therefore, a prima facie case of obviousness is lacking because

Szeliski and Seago do not teach, disclose or suggest these limitations of the claims and are therefore deemed patentable.

Examiner respectfully requests that applicant look to the response for claims 22 and 32 above.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERTA PRENDERGAST whose telephone number is (571)272-7647. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roberta Prendergast/
Examiner, Art Unit 2628
3/4/2011

/Ulka Chauhan/
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